CLAIMS

1. A mass spectrometer, comprising:

a sample chamber configured to receive a number of samples for mass spectral analysis, the sample chamber being evacuated to a first pressure,

an ionization chamber secured to the sample chamber, the ionization chamber being evacuated to a second pressure, the second pressure being less than the first pressure, and

a gate valve having a door, the gate valve being interposed between the sample chamber and the ionization chamber, the door of the gate valve being positionable between an open position and a closed position,

wherein (i) when the door is positioned in the open position the sample chamber is in fluid communication with the ionization chamber and (ii) when the door is in the closed position the sample chamber is substantially in fluid isolation from the ionization chamber.

2. The mass spectrometer of claim 1, further comprising a sample substrate having a number of samples disposed thereon, wherein:

the sample substrate is positioned in the sample chamber when the door is positioned in the closed position, and

a portion of the sample substrate is positioned in the ionization chamber when the door is positioned in the open position.

3. The mass spectrometer of claim 2, wherein:

the sample substrate comprises a tape having a first end thereof secured to a supply reel and a second end thereof secured to a take-up reel, and

both the supply reel and the take-up reel are positioned in the sample chamber.

4. The mass spectrometer of claim 3, wherein a portion of the tape between the supply reel and the take-up reel is positioned in the ionization chamber when the door is positioned in the open position.

5. The mass spectrometer of claim 1, further comprising a movable platform positioned in the sample chamber.

6. The mass spectrometer of claim 5, wherein:

the platform has a sample stage secured thereto, and

the platform is positionable between a first position in which the sample stage is positioned in the sample chamber and a second position in which a portion of the sample stage is positioned in the ionization chamber.

7. The mass spectrometer of claim 6, wherein the door is positioned in the open position when the sample stage is positioned in the second position.

8. The mass spectrometer of claim 1, further comprising:

a sample cassette having a supply reel and a take-up reel, and

a sample substrate having a first end thereof secured to the supply reel and a second end thereof secured to the take-up reel.

9. The mass spectrometer of claim 8, wherein:

the sample cassette further has a sample stage, and

the sample substrate is advance across the sample stage during advancement of the sample substrate from the supply reel to the take-up reel.

10. A MALDI mass spectrometer, comprising:

a sample chamber,

an ionization chamber, and

a valve positioned between the sample chamber and the ionization chamber, the valve being operable between (i) an open valve position in which the sample chamber is in fluid communication with the ionization chamber, and (ii) a closed valve position in which the sample chamber is isolated from the ionization chamber.

11. The MALDI mass spectrometer of claim 10, further comprising a vacuum system, the vacuum system being operable to maintain the ionization chamber and the sample chamber at different pressures.

12. The MALDI mass spectrometer of claim 11, wherein the vacuum system is operable to maintain the ionization chamber at a lower pressure relative to the sample chamber.

13. The MALDI mass spectrometer of claim 11, wherein the vacuum system is operable to maintain the ionization chamber at a lower pressure relative to the sample chamber when the valve is positioned in the closed valve position.

14. The MALDI mass spectrometer of claim 11, wherein the vacuum system is operable to maintain the ionization chamber at a lower pressure relative to the sample chamber when the valve is positioned in the open valve position.

15. The MALDI mass spectrometer of claim 10, further comprising a sample substrate having a number of samples disposed thereon, wherein:

the sample substrate is positioned in the sample chamber when the valve is positioned in the closed valve position, and

a portion of the sample substrate is positioned in the ionization chamber when the valve is positioned in the open valve position.

16. The MALDI mass spectrometer of claim 15, wherein:

the sample substrate comprises a tape having a first end thereof secured to a supply reel and a second end thereof secured to a take-up reel, and

both the supply reel and the take-up reel are positioned in the sample chamber.

17. The mass spectrometer of claim 16, wherein a portion of the tape between the supply reel and the take-up reel is positioned in the ionization chamber when the valve is positioned in the open valve position.

18. The MALDI mass spectrometer of claim 10, further comprising a movable platform positioned in the sample chamber.

19. The MALDI mass spectrometer of claim 18, wherein:

the platform has a sample stage secured thereto, and

the platform is positionable between a first position in which the sample stage is positioned in the sample chamber and a second position in which a portion of the sample stage is positioned in the ionization chamber.

20. The MALDI mass spectrometer of claim 19, wherein the valve is positioned in the open valve position when the sample stage is positioned in the second position.

21. The MALDI mass spectrometer of claim 10, further comprising:

a sample cassette having a supply reel and a take-up reel, and

a sample substrate having a first end thereof secured to the supply reel and a second end thereof secured to the take-up reel.

22. The MALDI mass spectrometer of claim 21, wherein:

the sample cassette further has a sample stage, and

the sample substrate is advanced across the sample stage during advancement of the sample substrate from the supply reel to the take-up reel.

23. A method of performing mass spectral analysis, the method comprising the steps of:

positioning a number of samples for mass spectral analysis in a sample chamber,

evacuating the sample chamber to a first pressure subsequent to positioning the number of samples therein,

subjecting the number of samples positioned in the sample chamber to the first pressure for a time period, and

advancing the number of samples from the sample chamber to an ionization chamber after the time period, wherein the ionization chamber has a second pressure therein that is less than the first pressure.

24. The method of claim 23, wherein:

the positioning step comprises disposing the number of samples on a tape, and

the advancing step comprises advancing the tape to the ionization chamber.

25. The method of claim 24, wherein advancing the tape to the ionization chamber comprises advancing the tape from a supply reel positioned in the sample chamber to the ionization chamber.

26. The method of claim 24, wherein advancing the tape to the ionization chamber comprises advancing the tape from a supply reel positioned in the sample chamber, through the ionization chamber, and onto a take-up reel positioned in the sample chamber.

27. A method of performing mass spectral analysis, the method comprising the steps of:

positioning a number of samples for mass spectral analysis on a tape,

sampling a first sample of the number of samples,

advancing the tape, and

sampling a second sample of the number of samples.

28. The method of claim 27, wherein:

a first end of the tape is secured to a supply reel,

a second end of the tape is secured to a take-up reel, and

the advancing step comprises rotating the supply reel and the take-up reel.

29. A method for performing mass spectral analysis, the method comprising the steps of:

disposing a number of samples for mass spectral analysis onto a substrate, wherein the disposing of the number of samples onto the substrate occurs under atmospheric pressure,

positioning the number of samples in a sample chamber,

evacuating the sample chamber to a first pressure subsequent to positioning the number of samples therein,

subjecting the number of samples positioned in the sample chamber to the first pressure for a time period, and

advancing the number of samples from the sample chamber to an ionization chamber after the time period, wherein the ionization chamber has a second pressure therein that is less than the first pressure.

30. The method of claim 29, wherein:

the disposing step comprises disposing the number of samples on a tape, and

the advancing step comprises advancing the tape to the ionization chamber.

31. The method of claim 30, wherein advancing the tape to the ionization chamber comprises advancing the tape from a supply reel positioned in the sample chamber to the ionization chamber.

32. The method of claim 30, wherein advancing the tape to the ionization chamber comprises advancing the tape from a supply reel positioned in the sample chamber, through the ionization chamber, and onto a take-up reel positioned in the sample chamber.

33. A MALDI mass spectrometer, comprising:

a vacuum system,

a sample chamber in fluid communication with the vacuum system, the sample chamber being evacuated to a first pressure by the vacuum system,

an ionization chamber in fluid communication with the vacuum system, the ionization chamber being evacuated to a second pressure by the vacuum system, the second pressure being less than the first pressure, and

a gate valve having a door, the gate valve being interposed between the sample chamber and the ionization chamber, the door of the gate valve being positionable between an open position and a closed position,

wherein (i) when the door is positioned in the open position the sample chamber is in fluid communication with the ionization chamber and (ii) when the door is in the closed position the sample chamber is substantially in fluid isolation from the ionization chamber.

34. The MALDI mass spectrometer of claim 33, further comprising a sample substrate having a number of samples disposed thereon, wherein:

the sample substrate is positioned in the sample chamber when the door is positioned in the closed position, and

a portion of the sample substrate is positioned in the ionization chamber when the door is positioned in the open position.

35. The mass spectrometer of claim 34, wherein:

the sample substrate comprises a tape having a first end thereof secured to a supply reel and a second end thereof secured to a take-up reel, and

both the supply reel and the take-up reel are positioned in the sample chamber.

36. The mass spectrometer of claim 35, wherein a portion of the tape between the supply reel and the take-up reel is positioned in the ionization chamber when the door is positioned in the open position.

37. The mass spectrometer of claim 34, further comprising a movable platform positioned in the sample chamber.

38. The mass spectrometer of claim 37, wherein:

the platform has a sample stage secured thereto, and

the platform is positionable between a first position in which the sample stage is positioned in the sample chamber and a second position in which a portion of the sample stage is positioned in the ionization chamber.

39. The mass spectrometer of claim 38, wherein the door is positioned in the open position when the sample stage is positioned in the second position.

40. The mass spectrometer of claim 34, further comprising:

a sample cassette having a supply reel and a take-up reel, and

a sample substrate having a first end thereof secured to the supply reel and a second end thereof secured to the take-up reel.

41. The mass spectrometer of claim 40, wherein:

the sample cassette further has a sample stage, and

the sample substrate is advanced across the sample stage during advancement of the sample substrate from the supply reel to the take-up reel.